

# Closing Remarks

## A GLIMPSE OF WHAT'S TO COME...?

This report has presented some of the latest research regarding how climate may change in the Great Lakes, and how that change may affect the people, plants, birds, fish, and other animals that live in the region. When we began this assessment with a workshop in 1998, many of the impacts we described for participants seemed far-fetched: Lake levels could fall so low they would interfere with recreational boating. In 1996 the lakes were near their record highs. Winter sports might be affected by winter warming . . . in Minnesota? As impossible as our scenarios may have seemed at the time, we have had to deal with such conditions in the past few years. While we cannot say that we were right about climate change, or that conditions won't swing back to "normal," we can learn from the experience of dealing with the impacts we've faced recently. While the greatest climate changes and their impacts may not appear in the region until later this century, temperatures and precipitation have been increasing slowly throughout the Great Lakes over the last hundred years. More significant changes have occurred lately that are consistent with our findings. Just in the last ten years, much above-normal temperatures and wide variations in precipitation have had both negative and positive impacts on many aspects of life. The aim of this report, and of the entire National Assessment Process, is to identify the potentially significant impacts and to inform the public and policy-makers of those impacts so they can minimize the negative ones and capitalize on the positive ones.

For example, the Midwest heat waves that occurred during the summer of 1995 killed over 700 people in Chicago. Most of the deaths occurred during a single heat wave in July. Over 160

people died in one day alone — shortly after the heat index exceeded 115°F on two consecutive days. That hot summer highlighted the need to be better prepared for future heat waves — particularly in urban areas of the Great Lakes region and especially because they will likely occur more frequently - as noted in this report.

Just a couple of years after the 1995 summer heat wave came the most intense El Niño ever recorded. Many of the Great Lakes States experienced one of their warmest winters ever and well-below normal snowfall. Although revenue at Midwestern ski resorts was down, snow removal and road maintenance costs were also down. The two winters after that, 1998-99 and 1999-2000, were influenced by La Niña and even though cooler and wetter than normal conditions were expected, the weather in the Great Lakes remained mild and had additional effects on the regional economy.

The above-normal temperatures and the reduced ice-cover over the last couple of winters, and the below-normal precipitation and above-normal evaporation over the last couple of years have led to some of the lowest lake levels being recorded on the Great Lakes in recent history. By spring 2000, lake levels on Lakes Michigan and Huron had dropped nearly three feet below chart datum. The sharp drops sent a wake-up call to residents regarding the significant impacts on commercial shipping, recreational boating, and drinking water quality — to name a few. The low-level, ice-free conditions on the Great Lakes over the last couple of years have provided an interesting situation for Great Lakes shippers — preventing them from carrying their normal-weight loads, but allowing them to ship goods for longer portions of the year.

Lake levels are a lynchpin for many other sectors of life in the Great Lakes. When they are low, impacts extend beyond creating difficulties for people involved in commercial shipping and recreational boating. For example, the number of ponds this spring dropped more than 40% from numbers last year (1999), and 20% below the long-term average (1974-1999). The reduced pond numbers, water levels, and below-normal precipitation this spring led to a slightly lower population of breeding ducks this spring, according to the US Fish and Wildlife Service's annual survey of key nesting areas for breeding ducks. There was an overall decline of 4% in breeding ducks – from 43.4 million to 41.8 million. Breeding populations of mallards fell 12% to 9.5 million.

Finally, a very early warm spell this year (Spring 2000) across the region led to the earliest spring bloom ever recorded. Temperatures hit 80°F on March 1st across much of Michigan – the earliest ever in the year to reach that temperature. A cold snap that followed threatened to be costly for many cherry growers in Michigan, but the actual damage was not bad. The early start to the growing season this year is an example of exactly what is expected to happen with climate change.

This report represents an attempt to better understand the massively complex earth-atmosphere-ocean system, and how climate change will influence all aspects of life. The report is based on output from some of the latest and most sophisticated General Circulation Models. These models now have the capability to simulate with reasonable accuracy the interactions between the oceans and the atmosphere, the transfer of heat and moisture between the ground and the atmosphere, and cloud development. Although the models are not perfect, there are several rea-

sons to believe that the impacts we have projected from their future scenarios will occur. First, the models have accurately recreated current conditions, which is in itself an accomplishment given the fact that the model simulations begin in the year 1900 (i.e. one hundred years ago). Second, simulations from different models are reasonably consistent in their future projections of wind patterns, storm frequencies and intensities, and temperature and precipitation changes. Third, a collection of recent impacts has occurred across the region that is consistent with many findings in this report.

An important spin-off of this report has been an opportunity for us to develop the knowledge, the tools, and the teamwork within the Great Lakes region so that when even more accurate climate and impacts models are developed, the infrastructure will be available to take better advantage of the more accurate information. An important aspect of the infrastructure is getting more stakeholder participation. In fact, in addition to informing the public of the possible impacts of climate change on the Great Lakes region, we hope this report will motivate stakeholders to get involved in the assessment process – to help guide our research, to answer questions of greatest concern to the public, and even to help conduct future assessments. Assessment is a process, and the Great Lakes assessment will continue to evolve to respond to stakeholder interest and to better scientific information and models.

Additional information on how to get involved and future climate impact assessment activities for the Great Lakes region is available on our web site: <http://glra.engin.umich.edu>.